



Department of Anesthesia Techniques
Title of the lecture: - Inhalational anesthesia



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Inhalational anesthesia

(Practical Anesthesia)

3^{ed} stage

By:

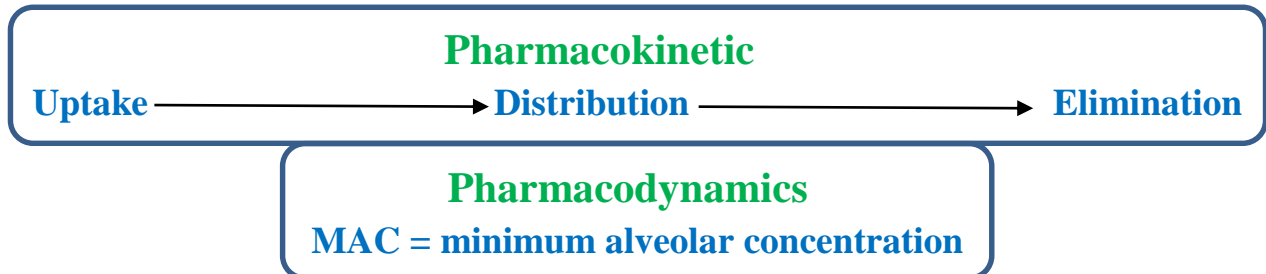
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Inhalational Anesthetic Agents

Inhalational anesthesia (maintenance) refers to the delivery of gases or vapors from the respiratory system to produce anesthesia (MAC value). Inhalation anesthetics (nitrous oxide, halothane, isoflurane, desflurane, sevoflurane and enflurane).



The volatile anesthetics (**halothane, isoflurane, sevoflurane, and desflurane**) are liquids at room temperature and require the use of vaporizers for inhalational administration. And **Nitrous Oxide** is already under normal conditions of temperature and pressure.

All inhalational anesthetics provide amnesia and immobility, except for nitrous oxide, which also provides analgesia.

Inhalational anesthetic agents

<p>1- Gas</p> <p>Nitrous oxide</p>	<p>2- volatile liquids</p> <p>Ether</p> <p>Halothane</p> <p>Isoflurane</p> <p>Sevoflurane</p> <p>Desflurane</p> <p>Enflurane</p>
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Agents	MAC for adults	MAC for pediatric	MAC with N2O
Halothane	0.75%	0.95%	0.3%
Isoflurane	1.2%	1.5%	0.5%
Sevoflurane	2%	2.3%	1.4%
Desflurane	6%	8%	3%
Enflurane	1.7%	2.1%	0.7%
N2O	104%	133%	

(MAC); - (mean the minimum alveolar concentration) defined as the minimum alveolar concentration of an inhalational anesthetic that prevents movement in 50% of patients in response to a stimulus (e.g. surgical incision).

MAC reflect the potency of volatile drugs
↑MAC = LOW POTENCY

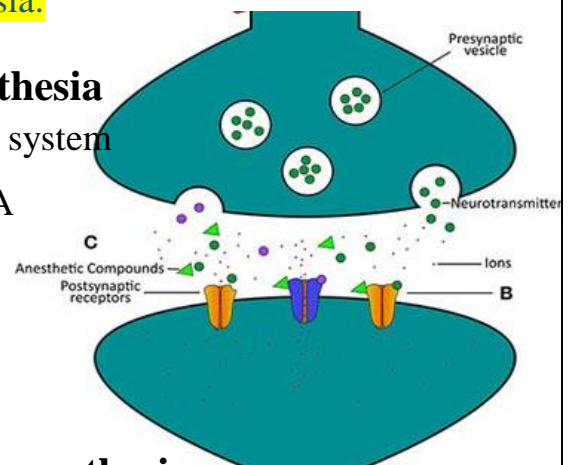
Characteristics of ideal anesthetic gas

1. pleasant to inhale mean a not irritant, not inflammable, rapid.
2. Rapid changes in the depth of anesthesia.
3. Be easy to administer.
4. Be easily and cheaply prepared in pure form.
5. Make adequate muscle relaxant.
6. Act at specific CNS sites to cause unconsciousness.
7. No CVS or respiratory effects, non-toxic to organ systems.
8. Provide post-op pain relief.

- No single agent yet identified is an ideal anesthesia.

Mechanism of action for inhalational anesthesia

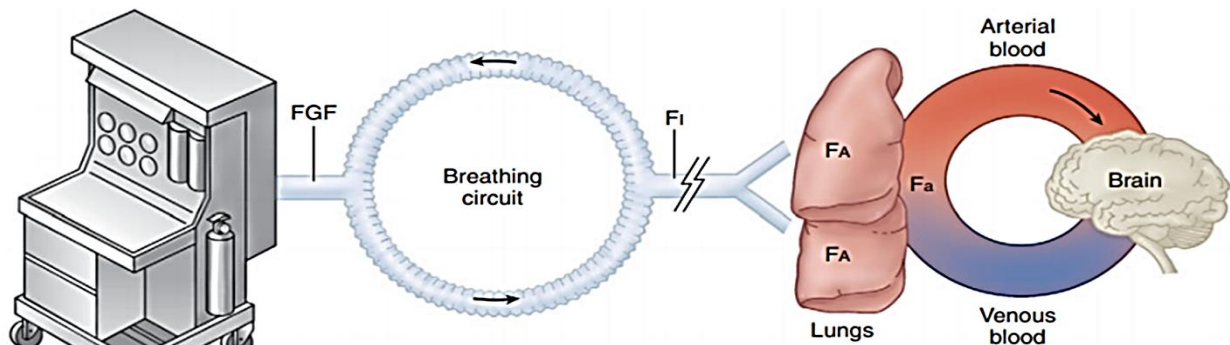
inhaled anesthetics work within the central nervous system by augmenting signals to chloride channels (GABA receptors) and potassium channels while depressing neurotransmission pathways.



Administration or uptake for inhalational anesthesia

The primary mode of administration is by inhalation through a face mask, laryngeal mask airway (LMA), or a tracheal tube.

Distribution of inhalational anesthesia



FGF (fresh gas flow) is determined by the vaporizer and flowmeter settings.

Anesthesia machine

I=inspiration / A= Alveoli / a= arterial

Elimination of inhalational anesthesia

Inhaled agents are primarily eliminated and exhaled unchanged by the lungs. Small percent of agent is metabolized.

MAC values vary under the following circumstances

- 1- ↓ in pre medicated patients.
- 2- ↓ in presence of N₂O.
- 3- ↑ in pyrexia.
- 4- ↑ hypercapnia.
- 5- ↓ with age. MAC is higher in infants and neonates than in adults.
- 6- Drugs which affect release of CNS neurotransmitters affect MAC. MAC ↑ in the presence of ephedrine and ↓ by methyldopa, pancuronium and clonidine.
- 7- ↑ atmospheric pressure = ↓ MAC, and vice versa

Halothane (MAC = 0.75%)

- Volatile liquid easily vaporized, stable, and nonflammable
- Most potent inhalational anesthetic
- Very soluble in blood and adipose
- Colorless, nonirritant, pleasant.
- 20% metabolized in liver “Halothane Hepatitis” 1/10,000 cases
- Malignant Hyperthermia & post-op shivering.



Isoflurane (MAC = 1.2%)

- Nonflammable, pungent
- Steal phenomena
- Colorless, volatile
- Not carcinogenic
- Broncho irritating, laryngospasm
- Not expensive compared to sevoflurane
- Rapid work and rapid recovery
- Main disadvantage is coronary vasodilation



Sevoflurane (MAC = 2%)

- Noninflammable and pleasant, non-irritant
- Low solubility in blood-- produces rapid induction
- Minimal systemic effects-- mild respiratory
- Expensive
- Rapid work and rapid recovery
- Main disadvantage is less potent and may be a agitation in pediatric.



Aluminum matters for sevoflurane

- Baxter sevo comes in a sleek, recyclable aluminum, container a unique design and strong.
- Convenience that save time.
- No wasted product and lightweight (easy to handle& use.
- Not only user friendly it can even prevent degradation of the product.



Desflurane (6%) and Enflurane (1.7%)

- Both are non-inflammable
- Both are potent anesthesia
- Because of high MAC to desflurane it means a less potency and wise versa to enflurane.
- Desflurane cause airway irritability make a cough, enflurane is sweet and ethereal odor.
- Desflurane has the most rapid onset of the volatile anesthetic
- Desflurane has an electric vaporizer not same to other anesthetic inhalation.
- Enflurane contraindicated in epilepticus



Nitrous Oxide (N₂O; Laughing gas) (MAC = 104%)

- It is a colorless nonirritating or tasteless and nonflammable gas.
- It causes excitement, delirium and amnesia in humans.
- low potency and must be combined with other inhalation anesthetics (halothane or isoflurane).
- Good analgesia and weak anesthesia.
- Not metabolized in the body excreted via lung.
- Main side effect is diffusion hypoxia, it is used in combination with oxygen and other inhalation anesthetic.

